THE DRY COLLODION PROCESS.

BY

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PREFACE.

The following pages shall be devoted to the description of a process on Dry Collodion, which I believe to be at once simple and effective. The experiments connected with the perfection of this process have occupied my leisure time for the space of two years or more, and have been conducted with all the care of which I was master. The constant repetition of them enables me to say, that whoever will follow diligently the process step by step, as detailed in this Pamphlet, must succeed in producing pictures in every way such as could be required by the most exacting critic.

The process is simple, clean, and expeditious; and the resulting Negatives possess the exquisite softness of Albumen, the brilliancy of the wet Collodion, and the fine artistic texture of the Paper process.

To disarm criticism, and to make peace with my fellow labourers in our art, I wish it to be understood that I do not claim the use of Collodion, of Gelatine, of Metagelatine, or of any of the Chemicals used in the process, most of these have been employed by others in various ways; I merely reserve to myself the pleasure of placing in the hands of Photographers a definite and simple plan by which pictures may be taken on Dry Collodion.

CHARLES A. LONG.

June 20, 1857.

THE

DRY COLLODION PROCESS.

Before describing in detail the manipulations of the process on Dry Collodion plates, it will be necessary to say a few words on the materials and apparatus to be employed, and also to give an account of the means of preparing the various solutions used in the process. First,

THE COLLODION.

This being the principal material we have to use, we must exercise great care in the selection of a sample that possesses all the characteristics which fit it for a dry process. We must reject all samples that possess great tenacity and contractile power: the Collodion must not be too thick, and it must flow evenly over the plate, and not set in ridges. The best condition for the Iodized Collodion is that known as *powdery*, that is, being spread on the plate and partially dry, it cannot be removed as a film, but crumbles up on being pressed by the finger in its passage across the plate; in fact, such a condition as would arise from using gun cotton prepared with acids at a high temperature.

The following formula will be found to answer most admirably:—

Gun Cotton	60 grains.
Absolute Alcohol . . .	5 ounces.
Sulphuric Æther, sp. gr. ·730	15 ounces.

The cotton is to be shaken up with the mixture of alcohol and æther, and when dissolved, the bottle containing it must be stood aside, in order that any undissolved particles of cotton may subside. The clear liquid may then be decanted into a clean bottle for use.

The Iodizing Solution that I have found to give the best results in this process is made in the manner following:—

Absolute Alcohol . . .	8 ounces.
Iodide of Cadmium . .	64 grains.
Iodide of Ammonium . .	64 grains.

The iodides are to be dissolved by agitation in the alcohol, and the resulting solution is to be carefully filtered, and preserved in a well-stoppered bottle.

The Iodized Collodion consists of—

Iodizing Solution .	2 drams.	1 ounce.
Plain Collodion .	6 drams.	

The Collodion should always be iodized at least twelve hours before it is required; this interval allows any insoluble matters either from the iodizing solution or from the Collodion itself to fall to the

bottom, and enables the operator to pour off the clear solution into a perfectly clean bottle for use.

Next in importance to the Iodized Collodion comes

THE PRESERVATIVE SOLUTION.

Some care is required in the preparation of this solution, in order that it may be clear and bright when finished, and not contain particles that would be deposited in its passage over the Collodion film when being used. The chief precaution to be observed is *not to allow it to boil too rapidly, and not to conduct the operation over too fierce a fire;* attention to this will prevent many failures, and ensure a solution in every way suited for the process.

Take 200 grains of the best transparent gelatine, cut into small shreds, and throw it into a pipkin in which has been previously placed 10 ounces of distilled water; set this on a slow fire, or over a lamp, until the gelatine is completely melted; then weigh out 100 grains of pure citric acid and dissolve it in 2 ounces of distilled water; add this to the solution of gelatine, stirring it during the addition with a glass rod. The solution in the pipkin is now to be gently boiled until half of it has evaporated; this should be in about 15 minutes: remove it from the fire, and add sufficient distilled water to make up the bulk of liquid to 12 ounces. When quite cold, the liquid in the pipkin is to be filtered through two

thicknesses of pure white blotting paper into a bottle perfectly dry and clean. We now add to every 12 ounces of filtered preservative solution, 1 ounce of alcohol, of the specific gravity of ·840.

The solution thus prepared is ready for use, and should be of a pale amber colour, without any signs of insoluble particles floating in it; should any appear after it has been prepared for some days, a second filtration will remove them, and render the liquid again bright and clear.

It will be found better to prepare this solution only in the quantity indicated above, unless the consumption be large, for, although it will keep good for a week or more, my experience points to the fact, that the most successful results follow the use of Preservative Solution freshly prepared.

THE NITRATE OF SILVER BATH.

The bath for rendering the plates sensitive does not differ from that recommended for taking negatives with wet Collodion. The formula for its preparation may not be out of place, however, and may assist those whose knowledge of the matter is not perfect.

Nitrate of Silver (fused) .	$1\frac{1}{4}$ ounces.
Distilled Water . . .	10 do.
Iodide of Cadmium . . .	3 grains.

Dissolve the nitrate of silver in the water and then add the iodide of cadmium; thoroughly agitate the

mixture for five or ten minutes, then add ½ ounce of alcohol, sp. gr. ·840, and 10 ounces of distilled water; further agitation, and subsequent filtration through two thicknesses of white bibulous paper, will put us in possession of a negative bath. The nitrate of silver being fused, and consequently, pure and neutral, and as it is essential to obtain clean pictures that the bath should be slightly acid in its reaction, we find it necessary to add 5 or 6 minims or drops of PURE glacial acetic acid to a bath of 20 ounces, in order that the above condition may obtain.

THE DEVELOPING SOLUTION

Is very simple in its nature, being merely a saturated solution of gallic acid in distilled water, to which has been added a small proportion of alcohol of sp. gr. ·840.

The exact formula is as follows:—

Distilled Water	20 ounces.
Alcohol sp. gr. ·840 . . .	1 ounce.
Gallic Acid	½ ounce.

The gallic acid will not be entirely dissolved, but that left at the bottom of the bottle will ensure the solution being saturated; it is better not to filter the developing solution until it is required for use, as it is preferable to allow it to stand over an excess of gallic acid, than for it to be withdrawn after a slight agitation with the crystals; it is a great error to suppose

that we obtain a saturated solution of gallic acid by merely agitating the crystals with water for a few moments.

The developing solution prepared as above directed, will keep good and in working order for some weeks, but when it becomes of a dark color, it would be safer to reject it and prepare a fresh quantity than to run the risk of a failure from an impure and imperfect developing agent.

NITRATE OF SILVER SOLUTION,

For adding to the gallic acid during development, is composed of

Fused Nitrate of Silver . .	30 grains.
Distilled Water	1 ounce.

THE FIXING SOLUTION

Consists of a solution of hyposulphite of soda in water, (filtered,) in the following proportion:—

Hyposulphite of Soda in crystals .	8 ounces.
Rain or Filtered Water . .	20 ounces.

The APPARATUS, &c. required in the Dry Collodion process is of the most simple kind, and consist of the following items:—

Glass plates.

Pneumatic plate holders.

Plate holder, for cleaning the plates.

Glass or porcelain dishes.

Glass or gutta percha dipping bath and dipper.
Silver hook, for lifting plates.
Levelling stand.
Measures, 1, 2, and 4 ounce.
Glass funnels.
Wash leather.
Some clean cloths and broad camel's hair brush.
Cotton wool.
Bibulous paper.

*The Chemicals are—

Nitrate of silver (fused.)
Glacial acetic acid.
Iodized collodion (dry.)
Gelatine.
Citric acid.
Alcohol.
Sulphuric æther.
Gallic acid.
Hyposulphite of soda.
Iodide of cadmium.
Benzoin varnish.

In the above list we presume that the operator is in possession of a suitable camera and lens, and the usual adjuncts of camera tripod, &c. &c. These should all be of the best kind, otherwise it will be impossible to obtain good results.

* The Dry Collodion and the various solutions, ready for use, may be obtained of the Publishers.

THE MANIPULATION.

The process of obtaining a picture on Dry Collodion plates is in itself a most simple and easy matter, but there are one or two precautions that appear necessary to ensure success, that cannot be lightly neglected. In the first place, it is absolutely certain, that if we want a clean and bright picture, we must have a plate perfectly free from all extraneous matters, such as soap, grease, &c. Various plans for cleaning the glass plate have been proposed, all more or less successful, but in most of them there is one great fault, namely, that of using a powder, as tripoli, rottenstone, &c., to rub off the dirt with. Now we find that in practice this will not answer, from the almost impossibility of getting rid of the floating particles of the powder when the plate is rendered slightly electrical by rubbing, and as each of these particles if it become enveloped in the Collodion film, would produce a spot on the finished picture, we find it necessary to search in another direction for a detergent for the glass plate to which this objection would not apply. One soon presents itself in the form of *old waste Collodion*—this spread on the glass plate and rubbed off again with cotton wool, makes the best and most perfect cleanser hitherto proposed, without any of the objec-

tions usually appended to other materials used for the same purpose.

The next precaution necessary to be observed, is, that all the solutions should be perfectly bright and clear; they should be absolutely free from floating particles of any kind. This is essential, as it is impossible to obtain clean pictures without attention to it, the floating bodies in the solution settle on the plate, and form so many nuclei, around which, in the development of the picture, the silver is deposited in an opaque mass, forming spots and blemishes on the surface of the plate.

There is one precaution that cannot be dispensed with, and that is, to be sure that the chemicals employed are of absolute purity; without this, success is very problematical, and vexation and disgust the sure reward of its neglect.

The process may for convenience be divided into the following stages:—

1.—Cleaning the plate.
2.—Coating it with Collodion.
3.—Rendering the plate sensitive.
4.—Applying the preservative solution.
5.—Exposure in the camera.
6.—Development of the picture.
7.—Fixing the developed image.
8.—Varnishing the finished negative.

CLEANING THE PLATE.

The glass plate is first to be thoroughly washed with an abundance of water and dried on clean cloths; it is then to be placed in the plate holder (*Fig.* 1), and have poured over its upper side a

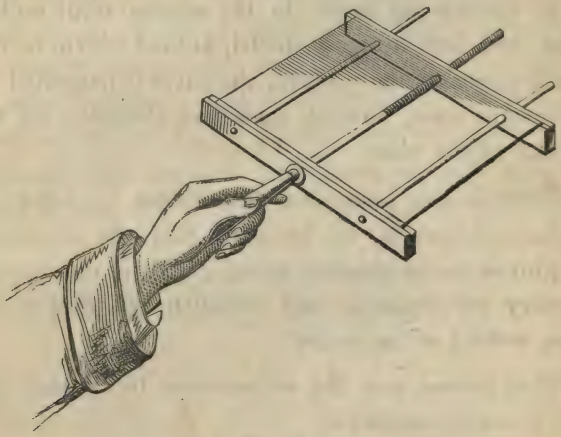

Fig. 1.

small quantity of old Collodion. Now take a tuft of cotton wool and rub the Collodion all over the plate, giving the hand a circular motion at the time: keep rubbing until the Collodion is very nearly dry, then turn the plate in the holder and repeat the same treatment with the opposite side: then lean the plate thus treated against a wall, while another, or any number are put through this stage. When a sufficient number have been so far cleaned, the plate holder

is to be carefully wiped, and the first plate—the edges of which have also been carefully wiped with a *clean* cloth—is to be replaced, and treated with a smart rubbing with a wash leather, the operator at intervals gently breathing on the plate. Both sides of the plate being cleaned in this way, it may be removed, after again wiping the edges carefully, to the plate box, to await the subsequent steps of the process. Plates cleaned in this manner should look perfectly transparent, and free from any marks of the cloth or leather, and when breathed upon should condense the moisture of the breath in one uniform degree over the whole surface. If patches of uneven condensation appear, a repetition of the process must be had recourse to.

The plate being clean, we proceed to the next step,

COATING THE PLATE.

Lay a piece of clean blotting paper on the table, larger than the plate we are about to use; place the clean plate on this, and then bring the pneumatic plate holder to bear on the centre of the glass, making sure that it has laid hold firmly. We then raise the plate with the left hand, and bring the surface upwards which was previously on the blotting paper; it will no doubt be found that small particles of dust have attached themselves to the plate, these must be removed by a broad and soft camel's hair brush.

The Collodion is then to be poured on, as shown in the diagram (*Fig. 2*), and the superfluous quantity

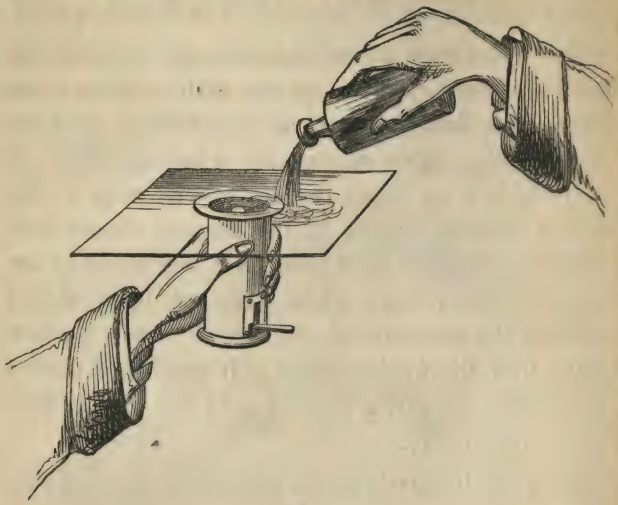

Fig. 2.

returned to the bottle from one of the corners of the plate. It does not matter which of the corners is used for this purpose, that which is most convenient to the operator assuming the preference. If the Collodion should have a tendency to set in ridges across the plate, a rocking motion, while the delivery corner is in the mouth of the bottle, may be given to it, still keeping the plate in a vertical plane. This will restore the film to perfect evenness and freedom from irregularity of any sort. The plate should be held in the vertical position for a few moments before being placed on the dipper to undergo the next operation of

RENDERING THE PLATE SENSITIVE.

The plate being placed, coated side outwards, on the dipper, is to be plunged without hesitation into the nitrate of silver bath (*Fig. 3*). This must be

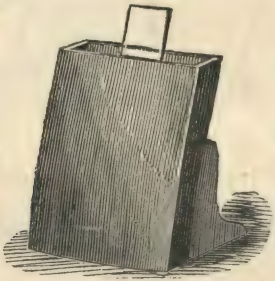

Fig. 3.

done without stopping, otherwise a line across the plate will indicate, on development, the position of the plate in the bath at the time this stoppage took place; so that if we were to immerse the plate by a series of jerks, we should have as a result, so many bands of unequal development in the finished picture; showing the importance of plunging the plate into the bath without any stoppage during its descent.

When the plate has rested for half a minute in the bath, it may be withdrawn, and quickly re-immersed. This washing must be continued at intervals, until the greasy appearance goes off, generally for the space of two minutes, when the plate is to be taken out of the bath and placed with its

lower edge on a pad of blotting paper, in the position as shown in the cut (*Fig.* 4). A fragment of

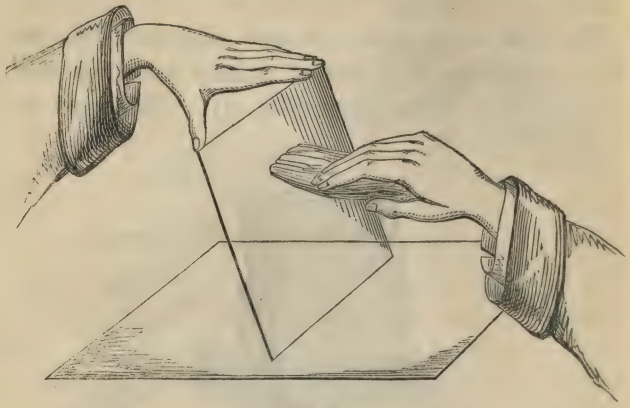

Fig. 4.

blotting paper is then to be used to absorb the moisture from the back of the plate, and a pneumatic plate holder—which should only be used for this purpose—is applied to it to form a support while

APPLYING THE PRESERVATIVE SOLUTION.

Taking the plate in the left hand by means of the pneumatic holder, incline it as shown in the diagram (*Fig.* 5); then having poured into a perfectly clean measure rather more of the preservative solution than is necessary to cover the plate twice,* pour half of it

* A plate, 9 inches by 7, takes about 1 ounce of solution.

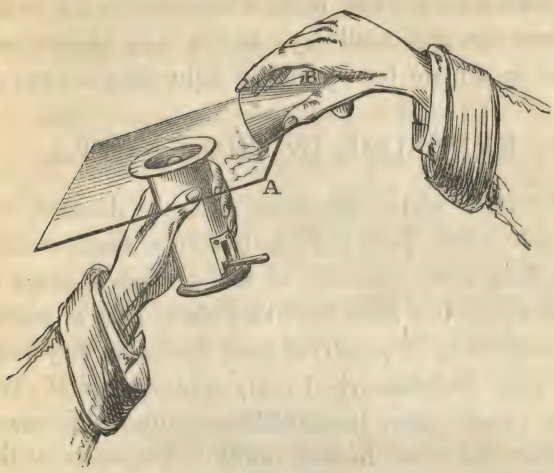

Fig. 5.

along the upper edge (A B) in such a manner, that a wave of the solution may flow uniformly from one end of the plate to the other, allow this to flow off into the waste pan or sink, and then bring the plate to the horizontal position, and pour on the remainder of the preservative solution, four times at least, allowing it to flow back into the measure from each corner in succession, in order that the whole plate may be brought uniformly under its influence. The plate is to be again placed on a piece of clean blotting paper (as shown at *Fig.* 4), and its back again wiped with a fragment of blotting or papier Joseph, in order to remove any of the preservative solution that may have run from the surface to the underside in the previous operation. The plate thus preserved is to

be reared on a piece of blotting paper with its face against the wall until dry, and is then to be stowed away in a plate box, perfectly light-tight to await the

EXPOSURE IN THE CAMERA.

Collodion plates preserved as above directed, will keep perfectly good and sensitive for a month at least; and from the appearance of the developed image on a plate that has been kept that time, I see at present no reason why, if preserved from the damp, they would not keep indefinitely. In my experiments, I have never found the least difference in sensitiveness, whether the plate be used within a few hours of the time of its preparation, or has been kept for a fortnight or three weeks; until however we have had more experience in the matter, it would be safer not to rely on plates more than a month old.

The time of exposure in the camera, of course varies in this process, under the same circumstances as it does with the wet Collodion; but I have found it as a general rule, that it is better to give the plate a full exposure than to fall into the opposite extreme: the mode of development allowing considerable latitude in this particular. With a 3-inch single lens, 16-inch focus, with a $\frac{1}{5}$-inch stop, the usual time for a bright landscape will be about 5 minutes; this of course is merely an approximation to the time of exposure, the exact time can only be arrived at by experience. I do not think I can do better than follow the

plan adopted in my "Practical Photography," of giving instances of under and over exposure, as a means of educating the tyro in the appearances that result from these conditions of the plate.

If the exposure has been of too short duration, the image will come out under the developing solution with difficulty; and after a continued immersion in it will only present the high lights, the deep shadows not being represented, or if so, in so faint a manner as to be useless in the picture.

An over exposed plate, when treated with the developing solution, will almost immediately give indications of the picture; and in a few minutes, the whole of the picture, deep shadows and all, will come out in unnatural force; on looking through the picture thus produced, we shall observe a great flatness in it, there is a want of contrast between the various parts, and although by continuing the development we might obtain a tolerably intense negative, the resulting picture would be flat, meagre, and unsatisfactory: on the contrary, a plate that has been exposed for the correct time, will comport itself very differently under development from the foregoing.

The sky and high lights will first appear, then the half-tones, and lastly, the parts of the picture that were in deep shadow will show themselves; this effect should take place in about 5 minutes from the time of immersion in the developing bath:

a picture that comes out sooner than this, is, as a general rule, over exposed; and one that is much after the 5 minutes before it makes its appearance, may be considered as under exposed.

We trust that the above instances may be of service in indicating the average time required for an exposure of the plate, but we must ask the reader not to take the figures given as actual values, but merely as very close approximations to the truth. We will imagine the plate to have been properly exposed, and proceed to

THE DEVELOPMENT OF THE PICTURE.

It is not necessary that the picture should be developed immediately after exposure in the camera; any time that is convenient to the operator may intervene between the processes, provided the aggregate time before and after exposure does not exceed the limits of keeping power of the plate.

The plate on being removed from the camera is placed face upwards in a porcelain or glass dish of a convenient size, (not too large,) and sufficient distilled water is to be poured over it to cover the surface thoroughly—this is for the purpose of removing the preservative solution, and must be allowed to remain on the plate for five minutes; the plate is then to be lifted in and out of the water by means of the silver hook, in order to wash off the preservative solution; this done, remove the plate to a perfectly clean dish,

and pour carefully over it the developing solution, composed of

Saturated Solution of Gallic Acid (p. 9)	8 ounces.
Solution of Nitrate of Silver (p. 10) .	2 drams.

THOROUGHLY MIXED.

In a few minutes the picture will begin to make its appearance, and will gradually unfold its details under the influence of the developer, until the whole of them are apparent; on raising the plate, however, when this stage of development is reached, and viewing it by transmitted light, the picture will appear weak and poor; we must now remove the plate from the bath, and add 2 drams more of the nitrate silver solution, and having thoroughly mixed it with gallic acid, we return the partially developed plate, which in the course of a few minutes will have acquired a great amount of intensity,—the exact degree can be regulated by the time of immersion: when the picture appears sufficiently intense, it is to be removed from the developing dish, and a gentle stream of water is poured over it, in order to remove any adhering developing solution, and stop all further reducing action on it.

During the whole time of the development, the gallic acid should remain quite clear; it will become slightly discoloured before the end of the development, but it ought not at any time to become muddy, or it will deposit a sort of sandy sediment on the

surface of the plate, which cannot be removed by subsequent washing.

The usual time occupied in the development of a successful picture is from 20 to 30 minutes, it might be developed much quicker by using pyrogallic acid, but at present I give the preference to the developer I have described, as I believe it to be more certain, and more under the control of the operator than the pyrogallic acid; and further, as it is not necessary to watch the development all the time it is going on, there can be very little saving of time in the more rapid method of bringing out the latent picture.

The picture being washed free from the adhering developing solution, is to be placed on the levelling stand, and subjected to the seventh part of the process.

FIXING THE DEVELOPED IMAGE.

This is accomplished by pouring over the surface of the plate sufficient solution of hyposulphite of soda (p. 10) to thoroughly cover it, this will dissolve out the unaltered iodide of silver, and give us a clear and bright picture, in which the deep shadows should be as transparent as the glass itself, and the high lights as dense as a piece of metal, the intermediate tones assuming their proper positions according to the intensity of the light that was concerned in their formation.

When the whole of the yellow iodide of silver is removed, the fixing solution may be thrown off, and the plate must be treated with an abundance of water; too much cannot well be given at this stage, as the hyposulphite adheres with great tenacity to the plate, even after a good washing. The back of the plate must be washed as well as the front, for I have found that a neglect of this precaution has ruined many a fine negative; the hyposulphite remaining at the back finding its way by capillary attraction to the surface, and once there, its destructive qualities are sure, sooner or later, to render themselves evident.

The picture being thoroughly washed, and either dried spontaneously or by the fire, has only to be covered with a film of gum. And now comes the last operation, of

VARNISHING THE FINISHED NEGATIVE.

Benzoin varnish is the best coating that can be given to a Collodion negative. It resists the action of pieces of grit; it does not crack; and above all, it does not, like amber varnish, split off the picture on the slightest friction.

The application of this varnish is a very simple matter. The negative is to be again placed on a pneumatic plate holder, and the varnish is to be poured on to the surface in precisely the same manner

as the Collodion was at the commencement of the process, the superfluous quantity being returned to the bottle: in a few moments the varnish will be quite dry and hard, and the plate may be handled with perfect safety.

I may mention, as a precaution, in varnishing the plate, that it is better to perform that operation in a still atmosphere; as the solvent of the gum being chloroform and very volatile, if it were conducted in a current of air, there might be some difficulty in obtaining an even coating to the picture.

In concluding this description of a process, which is at once simple and certain, I would ask the patient attention of those who may do me the honor of repeating my experiments. I have endeavoured to render the details of the process as intelligible as possible, and if I have succeeded in advancing the art of Photography only one step by so doing, I consider that it is an ample return for hours and days spent in anxious thought and laborious experiment.

FINIS.